

CHAPTER 6. VARIOUS MEASURES OF CENTRAL VALUE AND DISPERSION . . .	70
6-1. Other Measures of Central Value . . . . .	70
6-2. Comparison of Mean and Median . . . . .	71
6-3. Efficiency and Unbiasedness in Estimating $\mu$ . . . . .	74
6-4. Other Measures of Dispersion . . . . .	75
6-5. Efficiency and Unbiasedness in Estimating Dispersion . . . . .	76
6-6. Confidence-interval Estimate of the Mean . . . . .	79
6-7. Confidence-interval Estimates of $\sigma^2$ and $\sigma$ . . . . .	80
6-8. Estimation of a Proportion . . . . .	81
6-9. Estimates Using Inefficient Statistics . . . . .	82
6-10. Sample Size Required to Estimate with Desired Precision . . . . .	84
CHAPTER 7. STATISTICAL INFERENCE . . . . .	88
7-1. Statistical Hypothesis. . . . .	88
7-2. Level of Significance, $\alpha$ . . . . .	89
7-3. Second Type of Error, $\beta$ . . . . .	91
7-4. Test of Statistical Hypothesis . . . . .	93
7-5. Effect of Changes in $\alpha$ on the Critical Region and on $\beta$ . . . . .	93
7-6. Effect on the Critical Region of Varying $N$ . . . . .	95
7-7. Effect on $\beta$ of Changes in $\alpha$ and $N$ . . . . .	96
7-8. Dependence of $\beta$ on the Alternative Considered . . . . .	97
7-9. One-sided Tests . . . . .	97
7-10. Testing a Hypothesis in a Dichotomous Population . . . . .	99
CHAPTER 8. THE VARIANCE: ESTIMATION AND TESTS OF HYPOTHESES . . .	102
8-1. Sampling Distributions of $s^2$ and $F$ . . . . .	102
8-2. Tests of Hypotheses Concerning a Single Variance . . . . .	104
8-3. Tests of Hypotheses Concerning the Variances of Two Populations . . . . .	106
8-4. Values of $\beta$ for Tests Involving Variances . . . . .	107
8-5. Estimation of Variances Using Several Samples . . . . .	109
CHAPTER 9. THE MEAN: ESTIMATION AND TESTS OF HYPOTHESES . . . .	112
9-1. Comparison of Sample Mean and Population Mean when $\sigma^2$ is Known . . . . .	112
9-2. Comparison of Sample Mean and Population Mean when $\sigma^2$ is Unknown (the $t$ Distribution) . . . . .	115
9-3. Tests of Hypotheses Concerning the Means of Two Populations . . . . .	119
9-4. Pairing Observations . . . . .	124
9-5. Confidence Limits for Means. . . . .	127
9-6. Sampling of Intact Groups . . . . .	129
9-7. Tolerance Limits . . . . .	130
9-8. Control Charts. . . . .	130
CHAPTER 10. ANALYSIS OF VARIANCE . . . . .	139
10-1. Examples and Discussion of Several Problems. . . . .	140
10-2. Single Variable of Classification, Model I . . . . .	145
10-3. Individual Comparisons in the One-variable Case. . . . .	152
10-4. Two Variables of Classification, Single Observation . . . . .	155
10-5. Two Variables of Classification, Repeated Measurements . . . . .	163
10-6. Two-by-two Factorial Design, Individual Comparisons . . . . .	169
10-7. Latin Square . . . . .	171

## **INTRODUCTION TO STATISTICAL ANALYSIS**

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# INTRODUCTION TO STATISTICAL ANALYSIS

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## PREFACE

This textbook is written for a basic course in statistics to be taken by students from all fields in which statistics finds application. We have attempted to present the fundamental concepts of the subject in a manner which will show the student how general is the application of the statistical method. It is intended that interested students continue this type of training in courses giving special applications in their own fields after one, two, or three quarters of this course.

We have found that the contents of this revised text can easily be covered in a one-year course having either three lectures per week or two lectures with one laboratory per week. For shorter courses the following topics are suggested: For a one-semester course, Chapters 1 to 9 plus selections from any of Chapters 10, 11, 13, 17, and 20. For a one-quarter course, Chapters 1 to 7 plus selections from any of Chapters 9, 13, 17, and 20. Except for parts of Chapter 20 the only mathematical ability assumed of the student is a knowledge of algebraic addition, subtraction, and multiplication. We feel that the topic of probability is more meaningful for students having a minimum of mathematical background if it is presented late in the year course. With students who have the equivalent of two years of high school algebra some teachers may wish to present Chapter 20 quite early, and it has been arranged to make this convenient. It may be noted that in Chapter 20 we have avoided conventional gambling games, dice problems, etc., and have stressed the statistical applications of the theory.

The principal changes from the first edition are as follows: Chapters 6 and 7 are largely rewritten. Chapter 10 is completely rewritten and now covers several additional topics. Chapter 20 is a new chapter, dealing with probability. Many sections in other chapters are revised and new topics included. New tables are added to the Appendix and several of the original tables are expanded.

The order and emphasis of topics are based largely on the recommendations for a basic course in statistics stated by the committee on teaching of statistics of the National Research Council.

The concepts of distribution, sample, and population are introduced early. The elementary descriptive procedures of statistics are introduced as they are needed in the development of the ideas of sampling, tests of hypotheses, and design of experiments. The analysis of variance is introduced sufficiently early for its inclusion in a one-semester or two-term course. Modern developments (e.g., sequential analysis, nonparametric statistics) have been included because of their wide applicability and because of their validity under general conditions. The sampling distributions of the various statistics are introduced by means of experimental sampling. Experimental verifications of tabulated distributions have been carried out by comparing percentiles of observed sampling distributions with the mathematical results. The sampling experiments indicated at the end of the chapters are integrated so that computations on the samples drawn are used in several following class exercises. Samples may be drawn from the random-number tables or from populations of tags, disks, or beads. Our experience has indicated that the performance of sampling experiments by the students is one of the most effective aids to the understanding of statistical concepts. This is true for students with or without mathematical preparation.

Chapter 19 is an abridgment of an article by A. M. Mood and W. J. Dixon in the *Journal of the American Statistical Association*, March, 1948, p. 109. The material on the sign test in Chapter 17 is an abridgment of an article by the same authors in the December, 1946, issue of that journal. A portion of the material in Chapters 16 and 17 was developed by the authors under a contract with the Office of Naval Research at the Statistical Laboratory, Department of Mathematics, University of Oregon.

The authors wish to express their appreciation to Professor E. S. Pearson for permission to reprint from *Biometrika* parts of Tables A-7, A-8, A-9, A-13, A-18, and A-30; to S. K. Banerjee for permission to reprint from *Sankhyā* Table A-25; to the RAND Corporation for permission to print the random-number tables; to A. Hald and John Wiley & Sons for permission to copy certain percentiles forming part of Table A-7c. We are indebted to Sir Ronald A. Fisher, Frank Yates, and to Messrs. Oliver & Boyd, Ltd., Edinburgh, for permission to reprint, in part, Table III from their book *Statistical Tables for Biological, Agricultural and Medical Research*. For other tables in the Appendix we are indebted to C. Colcord, L. S. Deming, C. Eisenhart, M. W. Hastay, L. A. Knowler, R. F. Link, F. Mosteller, E. G. Olds, F. Swed, W. A. Wallis, J. E. Walsh, and E. K. Yost.

We wish to take this opportunity to express our appreciation to the many friends and colleagues who have made helpful criticisms and suggestions on the first edition and on preliminary revised forms of Chapters

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WILFRID J. DIXON  
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## CONTENTS

PREFACE . . . . .	v
LIST OF TABLES. . . . .	xiii
CHAPTER 1. INTRODUCTION . . . . .	1
1-1. Types of Proof . . . . .	1
1-2. Generality of Applications of Statistics . . . . .	2
1-3. Examples of Statistical Problems . . . . .	2
CHAPTER 2. DISTRIBUTIONS . . . . .	4
2-1. Observations . . . . .	4
2-2. Histogram . . . . .	5
2-3. Frequency Polygon . . . . .	8
CHAPTER 3. INTRODUCTION TO MEASURES OF CENTRAL VALUE AND DIS- PERSION . . . . .	14
3-1. Measures of Central Value. The Arithmetic Mean . . . . .	14
3-2. Measures of Dispersion. The Variance . . . . .	18
3-3. Effect of Uniform Change in the Observations . . . . .	21
3-4. Standard Scores . . . . .	23
CHAPTER 4. UNIVERSE AND SAMPLE. . . . .	30
4-1. Population, or Universe . . . . .	31
4-2. Sample . . . . .	32
4-3. Random Numbers. . . . .	33
4-4. Design of Experiments . . . . .	35
4-5. Sampling Distributions . . . . .	36
4-6. Sampling without Replacement . . . . .	42
4-7. Sampling Experiments . . . . .	43
CHAPTER 5. THE NORMAL DISTRIBUTION . . . . .	48
5-1. Equation of the Normal Curve . . . . .	48
5-2. An Example of the Normal Distribution . . . . .	50
5-3. The Cumulative Normal Distribution . . . . .	52
5-4. Areas under the Normal Curve . . . . .	53
5-5. Normal-probability Paper . . . . .	55
5-6. Standardized Normal Scores ( <i>T</i> Scores) . . . . .	58
5-7. Fitting a Normal Curve to a Histogram . . . . .	61
5-8. Sampling from a Dichotomous (Yes or No) Population . . . . .	62
5-9. Normal Populations . . . . .	66